**ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM**

**PERMIT FACT SHEET – PRELIMINARY DRAFT**

Permit Number: AK0053619

**Nikiski Combined Cycle Plant**

**DEPARTMENT OF ENVIRONMENTAL CONSERVATION**

**Wastewater Discharge Authorization Program**

**555 Cordova Street**

**Anchorage, AK 99501**

Public Comment Period Start Date: **3/27/2012**
Public Comment Period Expiration Date: **4/26/2012**
Alaska Online Public Notice System


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Proposed issuance of an Alaska Pollutant Discharge Elimination System (APDES) permit to

**ALASKA ELECTRIC AND ENERGY COOPERATIVE, INC.**

For wastewater discharges from

Nikiski Combined Cycle Plant
Mile 21.5 Kenai Spur Highway
Kenai, AK 99611

The Alaska Department of Environmental Conservation (the Department or DEC) proposes to issue an APDES individual permit (permit) to Alaska Electric and Energy Cooperative, Inc. The permit authorizes and sets conditions on the discharge of pollutants from this facility to waters of the United States. In order to ensure protection of water quality and human health, the permit places limits on the types and amounts of pollutants that can be discharged from the facility and outlines best management practices to which the facility must adhere.

This fact sheet explains the nature of potential discharges from the Nikiski Combined Cycle Plant and the development of the permit including:

- information on public comment, public hearing, and appeal procedures
- a listing of proposed effluent limitations and other conditions
- technical material supporting the conditions in the permit
- proposed monitoring requirements in the permit

**Public Comment**

Persons wishing to comment on, or request a public hearing for the draft permit for this facility, may do so in writing by the expiration date of the public comment period.

Commenters are requested to submit a concise statement on the permit condition(s) and the relevant facts upon which the comments are based. Commenters are encouraged to cite specific permit requirements or conditions in their submittals.

A request for a public hearing must state the nature of the issues to be raised, as well as the requester's name, address, and telephone number. The Department will hold a public hearing whenever the Department finds, on the basis of requests, a significant degree of public interest in a draft permit. The Department may also hold a public hearing if a hearing might clarify one or more issues involved in a permit decision or for other good reason, in the Department's discretion. A public hearing will be held at the closest practicable location to the site of the operation. If the Department holds a public hearing, the Director will appoint a designee to preside at the hearing. The public may also submit written testimony in lieu of or in addition to providing oral testimony at the hearing. A hearing will be tape recorded. If there is sufficient public interest in a hearing, the comment period will be extended to allow time to public notice the hearing. Details about the time and location of the hearing will be provided in a separate notice.

All comments and requests for public hearings must be in writing and should be submitted to the Department at the technical contact address, fax, or email identified above (see also the public comments section of the attached public notice). Mailed comments and requests must be postmarked on or before the expiration date of the public comment period.

After the close of the public comment period and after a public hearing, if applicable, the Department will review the comments received on the draft permit. The Department will respond to the comments received in a Response to Comments document that will be made available to the public. If no substantive comments are received, the tentative conditions in the draft permit will become the proposed final permit.

The proposed final permit will be made publicly available for a five-day applicant review. The applicant may waive this review period. After the close of the proposed final permit review period, the Department will make a final decision regarding permit issuance. A final permit will become effective 30 days after the Department's decision, in accordance with the state's appeals process at 18 AAC 15.185.

The Department will transmit the final permit, fact sheet (amended as appropriate), and the Response to Comments to anyone who provided comments during the public comment period or who requested to be notified of the Department's final decision.

The Department has both an informal review process and a formal administrative appeal process for final APDES permit decisions. An informal review request must be delivered within 15 days after receiving the Department's decision to the Director of the Division of Water at the following address:

Director, Division of Water
Alaska Department of Environmental Conservation
555 Cordova Street
Anchorage, AK 99501

Interested persons can review 18 AAC 15.185 for the procedures and substantive requirements regarding a request for an informal Department review.

See http://www.dec.state.ak.us/commish/InformalReviews.htm for information regarding informal reviews of Department decisions.

An adjudicatory hearing request must be delivered to the Commissioner of the Department within 30 days of the permit decision or a decision issued under the informal review process. An adjudicatory hearing will be conducted by an administrative law judge in the Office of Administrative Hearings within the Department of Administration. A written request for an adjudicatory hearing shall be delivered to the Commissioner at the following address:

Commissioner
Alaska Department of Environmental Conservation
410 Willoughby Street, Suite 303
Juneau AK, 99811-1800

Interested persons can review 18 AAC 15.200 for the procedures and substantive requirements regarding a request for an adjudicatory hearing. See http://www.dec.state.ak.us/commish/ReviewGuidance.htm for information regarding appeals of Department decisions.

**Documents are Available**

The permit, fact sheet, application, and related documents can be obtained by visiting or contacting DEC between 8:00 a.m. and 4:30 p.m. Monday through Friday at the addresses below. The permit, fact sheet, application, and other information are located on the Department's Wastewater Discharge Authorization Program website: http://www.dec.state.ak.us/water/wwdp/index.htm .

| | |
|---|---|
| Alaska Department of Environmental Conservation<br>Division of Water<br>Wastewater Discharge Authorization Program<br>555 Cordova Street<br>Anchorage, AK 99501<br>(907) 269-6285 | Alaska Department of Environmental Conservation<br>Division of Water<br>Wastewater Discharge Authorization Program<br>43335 Kalifornsky Beach Rd. - Suite 11<br>Soldotna, AK 99669<br>(907) 262-5210 |

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# 1.0 APPLICANT

This fact sheet provides information on the APDES permit for the following entity:

| | |
|---|---|
| Name of Facility: | Nikiski Combined Cycle Plant |
| APDES Permit Number: | AK0053619 |
| Facility Location: | Mile 21.5 Kenai Spur Highway, Kenai, AK 99611 |
| Mailing Address: | 280 Airport Way, Kenai, AK 99611-5280 |
| Facility Contact: | Mr. Bruce Linton, Environmental Compliance Officer, 907-283-6223 |

The map in Appendix A to the Fact Sheet shows the location of the treatment plant and the discharge location.

# 2.0 FACILITY INFORMATION

The Nikiski Combined Cycle Plant (NCC), a proposed combined cycle electric generation facility, is owned and will be operated by Alaska Electric and Energy Cooperative, Inc. (AEEC). The facility is located along Mile 21.5 of Kenai Spur Highway in Kenai.

AEEC (hereinafter the permittee) currently owns and operates a simple cycle electric generation facility on the present grounds. The facility, constructed in 2000 as a cogeneration plant, is equipped with a 40-mega watt (MW) natural gas-fired combustion turbine generator (CTG) and a heat recovery steam generator (HRSG). When operated as a cogeneration facility, the waste heat from the CTG was used to make steam in the HRSG, and that steam was supplied to the adjacent Agrium nitrogen fertilizer plant. The fertilizer plant, which was authorized to discharge under National Pollutant Discharge Elimination System (NPDES) permit No. AK0000507, was permanently shut down in 2008, at which time the HRSG was shut down and the facility became a simple cycle plant.

Under the current operating scenario, exhaust from the CTG is released to the atmosphere without beneficial use as waste heat. The permittee proposes to convert the existing simple cycle electric generation facility to a combined cycle electric generation facility. Under the proposed operating scenario, waste heat from natural gas combusting in the CTG will route to the HRSG, where the heat will be used to produce steam. The steam from the HRSG will be used to drive a new steam turbine generator (STG), thereby increasing power generation capacity from 40 MW (simple cycle configuration) to 77 MW (combined cycle configuration).

A water stack injection system is currently used to control nitrogen oxide emissions from the CTG, as required by the air quality control permit governing operation of the existing facility. Under the NCC project, steam make-up water will also be required to operate the HRSG. These two uses combined will require approximately 50 gallons per minute (gpm) of raw water, which will be supplied by a new off-site well located on a parcel east of the project site and south of North Miller Loop Road.

A high purity water treatment system is utilized to generate deionized water for process use. The system includes service water that is disinfected with sodium hypochlorite and includes granular activated carbon (GAC) adsorption, ultra violet (UV) disinfection, dechlorination with sodium bisulfite, an anti-scalant injection system, a two-stage reverse osmosis (RO) process unit, and a mixed bed ion exchange demineralizer.

There are three intermittent wastewater streams. These include: (1) RO first pass reject water; (2) decanted water from GAC back washes; and (3) wash down waters from the CTG and STG buildings.

Discharges from the GAC back wash and wash down waters are infrequent with the majority of effluent consisting of the RO reject waters.

The raw water and HRSG blow down are pumped to a 240,000 gallon fire/service water tank. Sodium hypochlorite is added to this tank to prevent fouling. Water treatment chemicals are added to the boiler system and are present in the boiler blow down. In addition, a scale inhibitor is injected upstream of the RO system.

Service water is occasionally pumped directly from the service water tank to the CTG and STG buildings. Both turbine buildings are equipped with sumps. Pressure wash wastewater and other occasional wastewaters are collected in the sumps and are pumped to two 2,000 gallon holding tanks located inside the CTG and STG buildings. After solids are allowed to settle and oil and grease separates, the water is decanted into a vacuum truck and checked for oil and/or other contaminants. If the water is determined to meet the requirements for discharge, it will be offloaded at the lift station sump, where it will be commingled with other wastewaters. If the wastewater does not meet specifications, it is trucked off-site to a permitted disposal facility. Solids and oils are hauled off-site for disposal. The frequency that the holding tanks are emptied is event-dependent; current estimates are approximately two to three times per year for each tank.

Service water for all other purposes is demineralized before use. From the service water tank, the water first flows through a GAC filter unit. Back washes of the GAC media bed occur based on pressure differential. Water used for back washes comes from the RO storage tank and consists of approximately 89% service water that has further undergone UV disinfection treatment and approximately 11% second pass RO reject water, which has also received UV treatment (second pass RO reject water is routed back to RO storage tank). Back wash waters contains solids flushed from the media bed. The back wash water goes to a 2,500 gallon dirty water tank, in which solids are allowed to settle. The solids are trucked off-site for disposal, and the decanted wastewater is routed to the effluent sump for discharge.

After the service water goes through the GAC, it goes through a UV chamber for disinfection before going to the RO storage tank. The water stream exiting the RO storage tank receives an RO scale inhibitor chemical feed and a sodium bisulfite feed to dechlorinate the water prior to the RO unit. The RO unit has two stages, and the first pass RO reject water is routed to the lift station sump for discharge. The permeate that passes through the first pass RO unit is then injected with sodium hydroxide (NaOH) before going through the second pass RO unit. Reject from the second pass RO flows back to the RO storage tank to be recycled back through the RO system. After the permeate leaves the RO system, it is routed through a mixed bed ion exchange process, producing demineralized water that then goes to a 100,000 gallon storage tank. The demineralized water is primarily for use as HRSG make-up water and CTG stack injection for nitrogen oxides control. The RO reject will be discharged to the effluent lift station sump at an average summer flow rate of 7-7.5 gpm and a winter average flow rate of 9-10 gpm (the seasonal difference is due to the higher power demand in the winter time). The RO system is operated in an "on/off" condition, as required to maintain the water level in the demineralized water storage tank, resulting in intermittent generation of RO reject water. A CO2 injection system is used to control pH of the mingled effluent stream to a range of 7.5 to 8.5 standard units (s.u.).

The maximum estimated worse case effluent temperature at the effluent sump is 27 °C. The mixture of blow down water and well water co-mingle within the Service Water Tank where the temperature will be approximately 23 °C, and will be generally maintained at this temperature due to the insertion-type heaters and the tank insulation. The water purification process occurs within the Water Treatment Building, and residence time in this building results in an approximate 4 °C rise in temperature from the service water tank to the effluent sump.

The lift station effluent sump is 72” in diameter and has a maximum water level of approximately 36 inches, resulting in a maximum water volume capacity of 634 gallons. More typically, the sump water level is managed around 12”. Under this operating scenario, the effluent residence time in the sump is 17 minutes, during which time some amount of cooling will occur. The effluent will be further cooled as it travels from the sump to the diffuser. At the maximum 35 gpm flow rate, effluent traveling down the discharge pipe cools an estimated 3.6°C. At the more typical discharge flow rate of 10 gpm, the effluent will reach thermal equilibrium with the surrounding ground temperature by the time it reaches the diffuser. Effluent is designed to be discharged to Cook Inlet at an average flow rate of 9 to 10 gpm, with periods of no discharge when the pump will be shut off and the sump refills.

A new pipeline (Outfall 001) has been constructed into Cook Inlet (Latitude 60° 40’ 34.3” N, Longitude -151° 23’ 41.3” W). The outfall extends beneath the seafloor approximately 1,000 feet from the mean lower low water (MLLW) shoreline, and then breaks through the seafloor and extends vertically approximately 5 feet above the seafloor. The outfall structure consists of diffusers located at two, three, and four feet elevation on the stem pipe (depths of approximately -34 feet MLLW, -33 feet MLLW, and -32 feet MLLW). The diffusers are equipped with 2-inch Tideflex® check valves to prevent inflow of seawater and provide protection from clogging. The diffuser assembly is anchored in place and embedded at least 20 feet into the hardpan of Cook Inlet.

# 3.0 EFFLUENT LIMITS AND MONITORING REQUIREMENTS

## 3.1 Basis for Permit Effluent Limits

The Clean Water Act (CWA or Act) requires that the limits for a particular pollutant be the more stringent of either technology-based effluent limits or water quality-based effluent limits (WQBELs). Technology-based effluent limits are set according to the level of treatment that is achievable using available technology. A WQBEL is designed to ensure that the water quality standards (WQS) of a water body are met. WQBELs may be more stringent than technology-based effluent limits. There are both technology-based effluent limits and WQBELs in the permit. The applicable technology-based effluent limit guidelines (ELGs) for process wastewater discharges from the steam electric power generating point source category are found in 40 CFR Part 423. The monitoring data used to calculate the WQBELs was supplied in the permit application. The basis for the proposed effluent limits in the permit is provided in Appendix B.

## 3.2 Basis for Effluent and Receiving Water Monitoring

In accordance with AS 46.03.110(d), the Department may specify in a permit the terms and conditions under which waste material may be disposed. Monitoring in a permit is required to determine compliance with effluent limits. Monitoring may also be required to gather effluent and receiving water data to determine if additional effluent limits are required and/or to monitor effluent impact on the receiving water body quality.

## 3.3 Effluent Limits and Monitoring Requirements

As previously mentioned in Section 3.1, the permit contains effluent limits that are both technology-based and water quality-based. The following summarizes the proposed effluent limits (see Appendices B through D for more details regarding the legal and technical basis surrounding the selection of effluent limits).

**Table 1: Outfall 001: Effluent Limits and Monitoring Requirements**

| | Effluent Limits | | | | | Monitoring Requirements | |
|---|---|---|---|---|---|---|---|
| **Parameter** | **Daily Minimum** | **Monthly Average** | **Daily Maximum** | **Units** | **Sample Location** | **Sample Frequency** | **Sample Type** |
| Total Discharge Flow [a] | N/A | Report | 50,400 | Gallons Per Day (GPD) | Effluent | Continuous | Recorded |
| Total Suspended Solids (TSS) [e] | N/A | 30.0 | 100.0 | mg/L | Effluent | 1/Month | 24-hour Composite [b] |
| | N/A | 12.6 | 42.0 | lb/day | | | |
| Oil and Grease [e] | N/A | 15.0 | 20.0 | mg/L | Effluent | 1/Month | Grab |
| | N/A | 6.31 | 8.41 | lb/day | | | |
| pH | 6.5 | N/A | 8.5 | Standard Units (SU) | Effluent | 5/Week | Grab |
| Temperature | N/A | N/A | Report | °C | Effluent | 1/Week | Grab |
| Polychlorinated Biphenyls (PCBs) [c] | N/A | N/A | No Discharge | µg/L | Effluent | 1/Year | 24-hour Composite [b] |
| Chlorine, Total Residual | N/A | 26 | 52 | mg/L | Effluent | 1/Month | Grab |
| Total Recoverable Arsenic | N/A | Report | Report | µg/L | Effluent | 1/Month | 24-hour Composite [b] |
| Total Recoverable Copper | N/A | N/A | Report | µg/L | Effluent | 1/Quarter | 24-hour Composite [b] |
| Chronic Toxicity | N/A | N/A | Report | $TU_c$ | Effluent | 2/Year [d] | 24-hour Composite [b] |

Notes:

a. The total wastewater discharge flow shall not exceed the maximum hydraulic design flow rate approved in the Final Approval to Operate issued by the Department. Final Approval to Operate means that the Department has reviewed and approved the wastewater treatment works engineered plans submitted to the Department in accordance with 18 AAC 72.210 through 18 AAC 72.285.

b. Composite samples must consist of at least eight grab samples collected at equally spaced intervals and proportionate to flow so that composite samples reflect effluent quality during the compositing period.

c. There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid (40 CFR §423.15(b))

d. Twice per year consists of one sample taken in the summer months (June 1– September 30) and one sample taken in the winter prior to freeze up (October 1- May 31).

e. Mass limitations are based on an effluent discharge volume of 35 gallons per minute.

## 3.4 Effluent Monitoring

The permit requires monitoring of the effluent for chlorine (total residual), oil and grease, pH, PCBs, and TSS to determine compliance with the permit effluent limits. In addition, the permit requires monitoring of the effluent for arsenic, copper, temperature, and whole effluent toxicity (WET) in order to conduct future reasonable potential analyses for these pollutants. Based on the very limited monitoring data submitted with the application arsenic, copper, and temperature all show reasonable potential to cause or contribute to an in-stream exclusion of applicable WQS at the end of the pipe prior to discharge to Cook Inlet; however, they do not show reasonable potential to exceed WQS at the boundary of the authorized mixing zone, therefore, monitoring only has been included for these pollutants.

The permittee utilizes chemical additives in their process waters. Many of these additives contain chlorine compounds, as such, chlorine and WET monitoring are used as indicator parameters to ensure the discharge is not impacting the receiving water. The permittee is required to notify the Department if new chemical additives are added to the process waters and supply the appropriate material safety data sheet.

Monitoring frequencies are based on the nature and effect of the pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance. The permittee has the option of taking more frequent samples than required under the permit. These additional samples can be used for averaging if they are conducted using the Department – approved test methods (generally found in 18 AAC 70 and 40 CFR Part 136 [adopted by reference in 18 AAC 83.010]) and if the Method Detection Limits (MDLs) are less than the effluent limits.

## 3.5 Whole Effluent Toxicity Monitoring

18 AAC 83.435 requires that a permit contain limits on WET when a discharge has reasonable potential to cause or contribute to an exceedance of a WQS. The permit includes semi-annual WET monitoring. The permit does not establish limits because no effluent monitoring data is available for determination of reasonable potential to cause or contribute to an exceedance of the WET numeric water quality criterion.

WET tests are laboratory tests that measure total toxic effect of an effluent on living organisms. WET tests use small vertebrate and invertebrate species and/or plants to measure the aggregate toxicity of an effluent. Chronic toxicity tests measure reductions in survival, growth, and reproduction over a 7-day exposure. Chronic toxicity monitoring shall be conducted according to the methods and species approved by US EPA in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms*, First Edition, EPA-600-R-95-136, August 1995.

Semi-annual monitoring will provide the data necessary to ascertain if WET limits are necessary in subsequent permit reissuances and to ensure the discharge is not imparting toxicity in the receiving water. The quantities of pollutants can be analytically determined; however, these measurements may not be able to specifically identify observable toxic responses, biological availability, and complex interactions within the effluent. If the permittee submits four consecutive sample results that indicate no toxicity, the permittee can submit a written request to DEC to suspend toxicity monitoring. Written permission from DEC is required prior to the permittee ceasing toxicity monitoring.

## 3.6 Receiving Water Limits and Monitoring Requirements

The Department is requiring the permittee to monitor for chlorine (total residual) in the receiving water to determine compliance with the effluent limits contained in the permit. The Department is requiring the permittee to monitor for temperature and arsenic in the receiving water this permit cycle to determine whether the discharge causes an exceedance in WQS in the receiving water. If the permittee has collected two years of sample results showing the discharge meets applicable WQS, they can submit a written request to DEC to suspend receiving water monitoring. Termination of receiving water monitoring must be confirmed in writing by DEC prior to the permittee ceasing receiving water sampling. Exclusion of this monitoring in the next permit issuance will not be considered backsliding.

**Table 2: Receiving Water Monitoring Requirements**

| Parameter | Units | Diffuser Sampling Frequency | Ambient Sampling Frequency | Method Detection Limit | Maximum Value | Sample Type | Sample Location |
|---|---|---|---|---|---|---|---|
| Temperature | °C | 2/Year[a] | N/A | N/A | Report | Grab | Boundary of mixing zone |
| Total Recoverable Arsenic | µg/L | 2/Year[a] | 2/Year[a] | 0.9 | Report | Grab | Boundary of mixing zone |
| Chlorine, Total Residual | µg/L | 2/Year[a] | 2/Year[a] | 10 | Report | Grab | Boundary of mixing zone |

Notes:

a. Twice per year consists of one sample taken in the summer (June 1– September 30) and one sample taken in the winter (October 1- May 31).

# 4.0 RECEIVING WATER

The permittee discharges effluent into Cook Inlet at a depth of approximately 34 feet below MLLW at latitude 60° 40’ 34.3” N, longitude -151° 23’ 41.3” W. The WQS at 18 AAC 70.020(a) classifies Cook Inlet as protected for the following marine water uses: aquaculture, seafood processing, and industrial water supply; contact and secondary water recreation; the growth and propagation of fish, shellfish, other aquatic life, and wildlife; and, the harvesting for consumption of raw mollusks or other raw aquatic life.

Section 403(a) of the CWA, Ocean Discharge Criteria, prohibits the issuance of a permit under Section 402 of the CWA for a discharge into the territorial sea, the water of the contiguous zone, or the oceans except in compliance with Section 403. Permits for discharges seaward of the baseline of the territorial seas must comply with the requirements of Section 403, which include development of an Ocean Discharge Criteria Evaluation.

An interactive map depicting Alaska’s baseline plus additional boundary lines is available at http://mapping.fakr.noaa.gov/NOAA_Territorial_Baselines/. The map is provided for information purposes only. The U.S. Baseline Committee makes the official determinations of baseline.

A review of the baseline line maps revealed that a baseline has been established from the southern portion of Kalgin Island crossing Cook Inlet to Ninilchik, approximately 32 miles southwest from the

NCC discharge point. The NCC discharges landward of this baseline; therefore, Section 403 of the CWA does not apply to the permit, and an Ocean Discharge Criteria Evaluation is not required.

## 4.1 Water Quality Standards

Regulations in 18 AAC 70 require that the conditions in permits ensure compliance with the WQS. The state's WQS are composed of use classifications, numeric and/or narrative water quality criteria, and an antidegradation policy. The use classification system designates the beneficial uses that each water body is expected to achieve. The numeric and/or narrative water quality criteria are the criteria deemed necessary by the state to support the beneficial use classification of each water body.

Water bodies in Alaska are designated for all uses unless the water has been reclassified under 18 AAC 70.230 as listed under 18 AAC 70.230(e). Some water bodies in Alaska can also have site–specific water quality criterion per 18 AAC 70.235, such as those listed under 18 AAC 70.236(b). The receiving water for the discharge, Cook Inlet (near Port Nikiski), has not been reclassified, nor have site-specific water quality criteria been established. Therefore, Cook Inlet (near Port Nikiski) must be protected for all marine water designated use classes listed in 18 AAC 70.020(a), which were previously listed in Section 4.0.

## 4.2 Water Quality Status of Receiving Water

Any part of a water body for which the water quality does not or is not expected to meet applicable WQS is defined as a "water quality limited segment" and placed on the state's impaired water body list. Cook Inlet (near Port Nikiski) is not included on the *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report,* July 15, 2010.

## 4.3 Mixing Zone Analysis

In accordance with state regulations at 18 AAC 70.240, as amended through June 23, 2003, the Department has authority to authorize a mixing zone in a permit. The applicant submitted a mixing zone model and report to the Department on October 5, 2011. The applicant utilized an updated merge (UM3) entrainment model to predict the effluent concentrations of pollutants of interest in the area surrounding the outfall location in Cook Inlet. The UM3 model uses conservation of mass, salinity, pollutant, and temperature to model the plume volume element through the course of its trajectory (Baumgartner et.al. 1994). Greater detail is provided in the Final Effluent Mixing Model submitted by the applicant. Based on the modeling effort and Department review, the mixing zone is authorized as follows: the acute mixing zone is circular with a radius of six meters from the diffuser with an associated dilution factor of 4000:1.The chronic mixing zone is circular with a radius of eight meters from the diffuser with an associated dilution factor of 7000:1. The most stringent WQS for temperature, copper, arsenic and chlorine will be met at and beyond the boundary of the authorized mixing zone.

The applicant requested the chronic chlorine standard not apply for chlorine (total residual) since the standard assumes that floating organisms will be exposed to the pollutant at concentrations above the criteria for four days, and with the tidal fluctuations in Cook Inlet, the maximum projected time for exposure is approximately seven minutes. From an acute standpoint, this is important because lethality is highly unlikely given the short exposure time. However, the Department maintains the establishment of effluent limits and conditions based on both the acute and the chronic water quality criteria for marine waters is appropriate and warranted to ensure protection of aquatic life and receiving water uses. Accordingly, the chronic chlorine standard has been included as well.

Appendix E, Mixing Zone Analysis Checklist, outlines criteria that must be considered when the Department analyzes a permittee's request for a mixing zone. These criteria include the size of the mixing zone, treatment technology, existing uses of the water body, human consumption, spawning areas, human health, aquatic life, and endangered species. All criteria must be met in order to authorize a mixing zone. The following summarizes this analysis:

4.3.1 **Mixing Zone Size.**

Model boundary conditions include position of the outfall structure, diffuser, and effluent port diameter. Variables include effluent discharge velocity, temperature, salinity, and estimated pollutant concentrations. Conservative (i.e. maximum) effluent conditions were used as effluent input variables. Cook Inlet ambient data were used to incorporate temperature, salinity, and current speeds in the Nikiski area. The model was run to simulate both summer and winter cases during such times where both effluent and ambient conditions differ. Four simulation scenarios were modeled. The first case simulated summer conditions at $10^{th}$ percentile current speeds, the second simulates summer conditions at $90^{th}$ percentile current speeds, the third simulates winter conditions at $10^{th}$ percentile current speeds, and the fourth simulates winter conditions at $90^{th}$ percentile current speeds. It was determined that worst case mixing conditions existed during winter conditions at $10^{th}$ percentile current speeds. This is a reasonable assumption due to power demands being greatest in the winter months and the reduced flushing ability of the receiving water at $10^{th}$ percentile tidal current velocities.

Using the worst case mixing conditions, the model was run to estimate the smallest practical mixing zones (acute and chronic) such that the effluent met the Alaska water quality criteria for aquatic life in marine waters. The acute and chronic mixing distances for dissolved metals (arsenic and copper) and temperature were less than one meter in all four simulated cases. The acute and chronic distances for achieving compliance with the water quality criteria for chlorine (total residual) is approximately six and eight meters, respectively.

4.3.2 **Technology.**

In accordance with 18 AAC 70.240(a)(3), as amended through July 2003, the Department finds that available evidence reasonably demonstrates that the effluent will be treated to remove, reduce, and disperse pollutants, using methods found by the Department to be the most effective and technologically and economically feasible, consistent with the highest statutory and regulatory treatment requirements. The water used in the steam electric process must be of high purity; therefore, the groundwater and other sources of water to the facility are treated prior to use. This includes treatment with granular activated carbon, reverse osmosis, chemical additions, and disinfection among others. Process wastewaters that don't meet APDES permit criteria are trucked off-site for disposal. The level of treatment wastewaters received for those discharged to Cook Inlet is dependent on the use of the water during the electric generation process. The treatment methods include pH neutralization with carbon dioxide, filtration, separation, and settling. Overall, these treatment methods are commonly employed and accepted throughout the U.S. for wastewater discharges associated with this industry.

4.3.3 **Existing Use.**

In accordance with 18 AAC 70.245, the mixing zone has been appropriately sized to fully protect the existing receiving water uses in the area covered under the permit. The discharge volume, outfall structure and location, and receiving water characteristics have been examined to ensure no impacts to the biological integrity of Cook Inlet. Based on the low volume of effluent discharged, the large tidal fluctuations and flushing occurring in Cook Inlet, and the small size of the authorized mixing zone, DEC has determined that the existing uses and biological integrity of the water body will be maintained and fully protected under the terms of the permit, as required in 18 AAC 70.245 (a)(1) and (a)(2), as amended through July 2003.

4.3.4 **Human Health.**

In accordance with 18 AAC 70.250(a)(1), 18 AAC 70.255(b) and (c), and 18 AAC 70.255(e)(3)(B), the mixing zone will not result in pollutants discharged at levels that will bioaccumulate, bioconcentrate, or persist above natural levels in sediments, water, or biota or at levels that otherwise will create a public health hazard through encroachment on a water supply or contact recreation uses. Of the pollutants expected in the discharge, the primary constituent of concern with respect to human health is arsenic. According to the United States Geological Survey, Alaska Science Center, the addition of arsenic to water in the Cook Inlet Basin due to industrial activity is minimal (Glass, Roy L, Distribution of Arsenic in Ground Water and Surface Water, Cook Inlet Basin, Alaska, 2001). Arsenic is a naturally occurring element and is commonly found in the Cook Inlet Basin due to recent glaciation and volcanic activity in the area. In a 2007 study, arsenic compounds were found to be speciated in marine fish and shellfish (Peshut, P.J. et al., 2007). In this study, inorganic arsenic, which is the form most often found in naturally occurring arsenic in groundwater, was found to be a minor component of the total arsenic fraction. Results found that the proportion of inorganic arsenic was far below the values typically used in human health risk assessments when total arsenic is analyzed. Target species included various trophic levels and included species commonly harvested for human consumption. For the majority of the samples, inorganic arsenic comprised less than 5% of the total arsenic content. Some higher levels were detected in mollusks, which tend to naturally contain higher levels of arsenic in general. These were in the range of 1% to 5%.

For this discharge, the outfall structure and mixing model were analyzed to determine if the effluent could potentially bioaccumulate, bioconcentrate, or persist above natural levels in the sediments, water, or biota of Cook Inlet. The outlet structure is approximately 10 feet above the sea floor. The mixing study estimates that the chronic arsenic criteria for marine discharges will be met less than one second and less than one meter from the point of discharge and that the acute criterion will be met sooner than the chronic criterion. Taking into account the arsenic and mixing studies discussed in preceding paragraphs, it has been determined that arsenic will not persist or occur at significantly adverse levels in Cook Inlet, the sediments, or biota.

Arsenic is listed as a carcinogen. However, as detailed above, arsenic is projected to meet applicable WQS in less than one meter from the outfall. The receiving water is not used as a drinking water source and contact recreation or other potential sources of exposure to the effluent is highly unlikely due to the outfall location. Based on a review of the applicant’s mixing study, the speciation study, and the information provided herein, the Department concludes that the discharge conditions are consistent with 18 AAC 70.250(a)(1), 18 AAC 70.255(b) and (c), and 18 AAC 70.255(e)(3)(B).

4.3.5 **Spawning Areas.**

In accordance with 18 AAC 70.255(h), as amended through July 2003, the mixing zone is not authorized in an area of anadromous fish spawning or resident fish spawning redds for Arctic grayling, northern pike, rainbow trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, king, and sockeye salmon.

4.3.6 **Aquatic Life.**

In accordance with 18 AAC 70.250(a)(2)(A-C), 18 AAC 70.250(b)(1), 18 AAC 70.255(g)(1) and (2), and 18 AAC 70.255(b)(1) and (2), as amended through July 2003, pollutants for which the mixing zone will be authorized will not result in concentrations outside of the mixing zone that are undesirable, present a nuisance to aquatic life, permanent or irreparable displacement of indigenous organisms, or a reduction in fish or shellfish population levels. Based on the low discharge volume, outfall structure and location, mixing zone modeling, and tidal fluctuations at the point of discharge, the Department concludes that the discharge will meet all WQS outside the mixing zone.

4.3.7 **Endangered Species.**

In accordance with 18 AAC 70.250(a)(2)(D), as amended through July 2003, the mixing zone will not cause an adverse effect on threatened or endangered species. Impacts to overall water quality, and any threatened or endangered species therein, are not expected based on the small size of the mixing zone, the discharge characteristics, and the extreme tidal fluctuations associated with the receiving water.

# 5.0 ANTIBACKSLIDING

18 AAC 83.480 requires that “effluent limitations, standards, or conditions must be at least as stringent as the final effluent limitations, standards, or conditions in the previous permit.” 18 AAC 83.480(c) also states that a permit may not be reissued “to contain an effluent limitation that is less stringent than required by effluent guidelines in effect at the time the permit is renewed or reissued.” This facility is a new source and this is the initial APDES permit for this facility; therefore, antibacksliding provisions are not applicable.

# 6.0 ANTIDEGRADATION

Section 303(d)(4) of the CWA states that, for water bodies where the water quality meets or exceeds the level necessary to support the water body's designated uses, WQBELs may be revised as long as the revision is consistent with the State's antidegradation policy.

The Antidegradation Policy of the WQS (18 AAC 70.015) states that the existing water uses and the level of water quality necessary to protect existing uses must be maintained and protected. This section analyzes and provides rationale for the Department's decisions in the permit issuance with respect to the Antidegradation Policy.

The Department's approach to implementing the Antidegradation Policy, found in 18 AAC 70.015, is based on the requirements in 18 AAC 70 and the Department's *Policy and Procedure Guidance for Interim Antidegradation Implementation Methods*, dated July 14, 2010. Using these requirements and policies, the Department determines whether a water body, or portion of a water body, is classified as Tier 1, Tier 2, or Tier 3, where a higher numbered tier indicates a greater level of water quality protection. At this time, no Tier 3 waters have been designated in Alaska. Accordingly, this antidegradation analysis conservatively assumes that the discharge is to a Tier 2 water, which is the next highest level of protection and is more rigorous than a Tier 1 analysis.

The State's Antidegradation Policy in 18 AAC 70.015(a)(2) states that if the quality of water exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water (i.e. Tier 2 waters), that quality must be maintained and protected. The Department may allow a reduction of water quality only after finding that five specific requirements of the antidegradation policy at 18 AAC 70.015(a)(2)(A)-(E) are met. The Department's findings follow:

1. **18 AAC 70.015 (a)(2)(A).** Allowing lower water quality is necessary to accommodate important economic or social development in the area where the water is located.

   Issuance of the permit will allow AEEC to reduce its dependence on importing power from neighboring utilities. In addition, operation of the proposed facility and dispatching of power is anticipated to result in approximately 20 new jobs to the area. According to AEEC's antidegradation analysis submitted with their application, the electric utility purchases approximately 90 percent of its power from Chugach Electric Association (CEA) under a contract that expires on December 31, 2013. AEEC identified and evaluated a number of power supply options, which included construction of the NCC plant, renewing the CEA contract, purchasing power from other sources, and partnering with other electric utilities on different power production projects.

   After a thorough alternatives analysis and opportunity for public input, the AEEC governing board selected the NCC project because it met all of AEEC's power supply objectives and necessary operational requirements, including: providing AEEC with control over the construction and operating costs of their power supply system; allowing AEEC to integrate renewable energy projects into their power supply system in the future; making good use of existing assets; creating additional jobs on the Kenai Peninsula; and providing reliable power sources for AEEC customers.

   The Department concludes that the operation of the NCC facility and the authorization of the discharge accommodates the important economic and social development of AEEC and its customers. The Department finds that the authorization of NCC's discharge accommodates important economic and social development in the area and that this requirement is met.

2. **18 AAC 70.015 (a)(2)(B).** Except as allowed under this subsection, reducing water quality will not violate the applicable criteria of 18 AAC 70.020 or 18 AAC 70.235 or the whole effluent toxicity limit in 18 AAC 70.030.

   Discharge allowed by the permit at Outfall 001 conforms to the requirements of 18 AAC 70.020 and 18 AAC 70.030. Modeling results indicate that all WQS will be met within one meter of the diffuser, with the exception of chlorine (total residual), which will be met within eight meters of the diffuser. Accordingly, WQS will not be exceeded at or beyond the boundary of the mixing zone as result of the authorized discharge. Also, it is not expected that the low-volume discharge is toxic, so reducing water quality is not expected to violate the whole effluent toxicity limit in 18 AAC 70.030; however, toxicity monitoring is required during this permit cycle to validate this expectation. The Department finds that the reduced water quality will not violate applicable water quality criteria and that the requirement is met.

3. **18 AAC 70.015(a)(2)(C).** The resulting water quality will be adequate to fully protect existing uses of the water.

   The WQS, upon which the permit effluent limits are based, serve the specific purposes of protecting the existing and designated uses. Accordingly, the permit effluent limits restricting the discharge will ensure that water quality criteria will not be exceeded at or beyond the boundary of the mixing zone. The Department finds that the resulting water quality will be adequate to fully protect existing and designated uses and that the requirement is met.

4. **18 AAC 70.015(a)(2)(D).** The methods of pollution prevention, control, and treatment found by the Department to be most effective and reasonable will be applied to all wastes and other substances to be discharged.

   The Department finds the most effective and reasonable methods of prevention, control, and treatment are the practices and requirements set out in the APDES permit. This type of treatment and associated discharge is similar in nature to other like facilities and their discharges located throughout the U.S. Further, because of the widespread employment of this type of treatment and subject wastewater discharge, EPA promulgated technology-based ELGs to regulate this group of discharges (40 CFR Part 423, Steam Electric Generation Point Source Category). The development of the ELG included an extensive analysis of economic treatment alternatives for these types of discharges and concluded this type of pollution prevention, control and treatment is effective and reasonable. In addition, the permittee is required to develop and implement a Quality Assurance Project Plan (QAPP) and a Best Management Practices (BMP) Plan. Adherence to the limits in the permit will ensure that the treatment will be the most effective and reasonable. The Department concludes that the most effective and reasonable methods of pollution prevention, control, and treatment will be applied and find that the requirement is met.

5. **18 AAC 70.015(a)(2)(E).** All wastes and other substances discharged will be treated and controlled to achieve (i) for new and existing point sources, the highest statutory and regulatory requirements; and (ii) for nonpoint sources, all cost-effective and reasonable best management practices.

   For Outfall 001, applicable "highest statutory and regulatory treatment requirements" are defined in 18 AAC 70.990(30) (as amended June 26, 2003) and in the July 14, 2010, DEC guidance titled "Interim Antidegradation Implementation Methods." Accordingly, there are three parts to the definition, which are:

   - (A) any federal technology-based effluent limitation identified in 40 CFR 125.3 and 40 CFR §122.29, as amended through August 15, 1997, adopted by reference;
   - (B) minimum treatment standards in 18 AAC 72.040; and
   - (C) any treatment requirements imposed under another state law that is more stringent than a requirement of this chapter.

The first part of the definition includes all federal technology-based ELGs, which would include those that apply to the NCC facility at 40 CFR Part 423 (Steam Electric Generation Point Source Category). The permit implements the ELGs that follow new source performance standards that apply to low-volume wastes. The second part of the definition 18 AAC 70.990(B) (2003) appears to be in error, as 18 AAC 72.040 describes discharges to sewers and not minimum treatment. The correct reference appears to be the minimum treatment standards found at 18 AAC 72.050, which refers to domestic wastewater discharges only. The NCC facility does not discharge domestic wastewater; therefore, this regulation does not apply. The third part of the definition includes any more stringent treatment required by state law, including 18 AAC 70 and 18 AAC 72. The correct operation of equipment, visual monitoring, and implementing BMPs, as well as other permit requirements, will control the discharge and satisfy all applicable federal and state requirements. The Department concludes that all wastes and other substances discharged will be treated and controlled to achieve the highest statutory and regulatory requirements and finds that this requirement is met.

If potential water quality impairment associated with a thermal discharge is involved, the antidegradation policy described in this section is subject to 33 U.S.C. 1326 (commonly known as Section 316 of the CWA). Based on the temperature mixing modeling, the most stringent water quality criteria for temperature will be met approximately one meter away from the discharge pipe. Accordingly, the discharge is highly unlikely to cause a temperature water quality impairment.

# 7.0 OTHER PERMIT CONDITIONS

## 7.1 Quality Assurance Project Plan

The permittee is required to develop procedures to ensure that the monitoring data submitted are accurate and to explain data anomalies if they occur. The permittee is required to develop the Quality Assurance Project Plan (QAPP) within 60 days of the effective date of the final permit. Additionally, the permittee must submit a letter to the Department within 120 days of the effective date of the permit stating that the Plan has been implemented within the required time frame. The QAPP shall consist of standard operating procedures the permittee must follow for collecting, handling, storing and shipping samples; laboratory analysis; and data reporting. The Plan shall be retained on site and made available to the Department upon request.

## 7.2 Best Management Practices Plan

In accordance with AS 46.03.110 (d), the Department may specify in a permit the terms and conditions under which waste material may be disposed. This permit requires the permittee to develop a Best Management Practices (BMP) Plan in order to prevent or minimize the potential for the release of pollutants due to plant site runoff, spillage or leaks, or erosion. The permit contains certain BMP conditions that must be included in the BMP Plan. The permit requires the permittee to develop or update and implement a BMP Plan within 180 days of the effective date of the final permit. The Plan must be kept on site and made available to the Department upon request.

## 7.3 Standard Conditions

Appendix A of the permit contains standard regulatory language that must be included in all APDES permits. These requirements are based on the regulations and cannot be challenged in the context of an individual APDES permit action. The standard regulatory language covers requirements such as monitoring, recording, reporting requirements, compliance responsibilities, and other general requirements.

# 8.0 OTHER LEGAL REQUIREMENTS

## 8.1 Endangered Species Act

The Endangered Species Act (ESA) requires federal agencies to consult with the National Oceanic and Atmospheric Administration Marine Fisheries (NMFS) and the U.S. Fish and Wildlife Service (USFWS) if their actions could beneficially or adversely affect any threatened or endangered species. As a state agency, DEC is not required to consult with these federal agencies regarding permitting actions: however, DEC voluntarily contacted the agencies to notify them of the issuance of this permit and to obtain listings of threatened and endangered species near the proposed discharge.

The following are responses from NMFS and USFWS regarding potential effects to threatened or endangered species in the vicinity of the NCC discharge:

- In an email dated June 8, 2011, NMFS identified the endangered Cook Inlet beluga whale (*Delphinapterus leucas*) as occurring within the range of Cook Inlet near Port Nikiski. The area of Cook Inlet near Port Nikiski has been designated as critical habitat for the Cook Inlet beluga whale. NMFS also identified the endangered Steller sea lion (*Eumetopias jubatus*) as being recorded in Cook Inlet near Port Nikiski, but they believe the Steller sea lion is not likely to occur near the discharge. The same area of Cook Inlet has not been designated as critical habitat for the Steller sea lion (NMFS 2011a).
- In an email dated June 21, 2011, USFWS indicated that no ESA-listed, proposed, or candidate species under its jurisdiction had been recorded in Cook Inlet near Port Nikiski. However, USFWS indicated that large concentrations of Steller's eider (*Polysticta stelleri*) have been observed wintering in Cook Inlet near Clam Gulch and Ninilchik. Furthermore, critical habitat has been designated for the Southwest Alaska population of the Northern sea otter (*Enhydra lutris kenyoni*) as far north as Cook Inlet near Tuxedni Bay (USFWS, 2011).

## 8.2 Essential Fish Habitat

Essential fish habitat (EFH) includes the waters and substrate (sediments, etc.) necessary for fish from commercially-fished species to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires federal agencies to consult with NMFS when a proposed discharge has the potential to adversely affect (reduce quality and/or quantity of) EFH. As a state agency, DEC is not required to consult with federal agencies regarding permitting actions: however, DEC contacted NMFS to notify them of the issuance of this permit and to obtain listings of EFH near the subject discharge.

NMFS was contacted on June 8, 2011, to confirm preliminary findings of several EFH species identified in Cook Inlet near Port Nikiski; however, no response was received from NMFS. Based on existing information provided by NMFS, the following species have been identified as having EFH in Cook Inlet near Port Nikiski (NMFS, 2011b):

- Chinook salmon (marine juvenile, marine immature, maturing adult life stages)
- Chum salmon (marine juvenile, marine immature, maturing adult life stages)
- Coho salmon (marine juvenile, marine immature, maturing adult life stages)
- Pink salmon (marine juvenile, marine immature, maturing adult life stages)
- Sockeye salmon (marine juvenile, marine immature, maturing adult life stages)

## 8.3 Permit Expiration

The permit will expire five years from the effective date of the permit.

## 9.0 References


1. Alaska Department of Environmental Conservation, 2003. *Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances*, as amended through December 12, 2008.

2. Alaska Department of Environmental Conservation, 2008. *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report*

3. Alaska Department of Environmental Conservation, 2010. *Interim Antidegradation Implementation Methods.* Retrieved from http://www.dec.state.ak.us/water/wqsar/Antidegradation/docs/P&P-Interim_Antidegradation_Implemenation_Methods.pdf

4. National Marine Fisheries Service (NMFS), Alaska Region, Protected Resources Division, 2011. *Email correspondence.* June 8, 2011.

5. NMFS, Office of Habitat Conservation, 2011. *Essential Fish Habitat Mapper*. Retrieved from http://sharpfin.nmfs.noaa.gov/website/EFH_Mapper/map.aspx.

6. U.S. Environmental Protection Agency. 1991. *Technical Support Document for Water Quality-based Toxics Control*. Office of Water Enforcement and Permits, Office of Water Regulations and Standards. Washington DC, March 1991. EPA/505/2-90-001.

7. U.S. Fish and Wildlife Service (USFWS), Endangered Species Program, 2011. *Email correspondence.* June 22, 2011.

8. U.S. Geological Survey (USGS). 2001. *Distribution of Arsenic in Water and Streambed Sediments, Cook Inlet Basin, Alaska*. Alaska Science Center. Anchorage, AK, September 2001. USGS Fact Sheet FS-083-01.

9. Peshut, P.J. et al. 2007. *Arsenic speciation in marine fish and shellfish from American Samoa*, Chemosphere (2007). Doi: 10.1016/j.chemosphere. 2007.10.014.

**APPENDIX A. FACILITY INFORMATION**

**Figure 1: Nikiski Combined Cycle Plant Map**


Title/Notes:

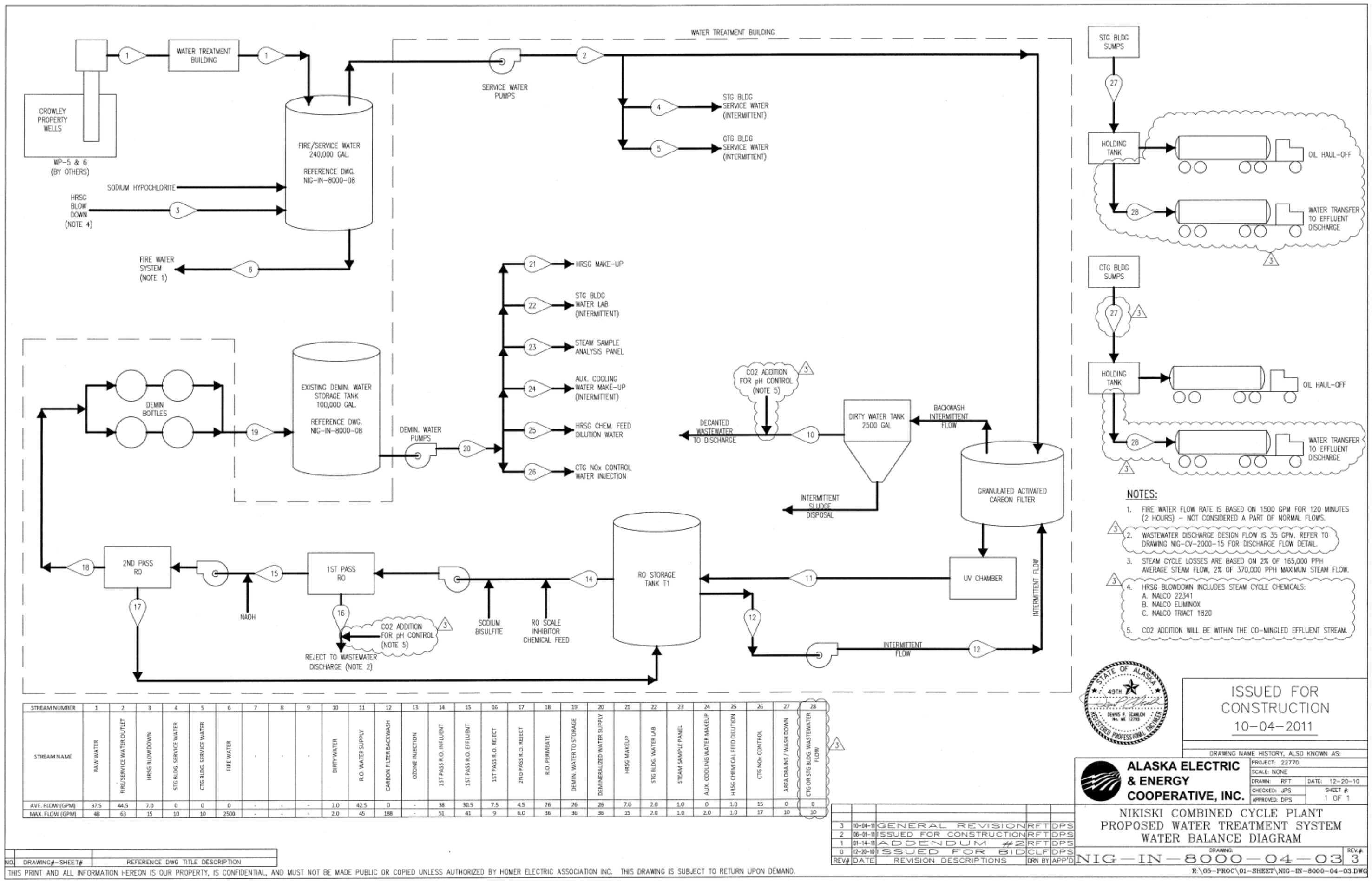
**USGS Map Showing Location of the Project**

(Facility boundary is outlined in red, the effluent discharge line is blue)

Figure:

**1**

# Figure 2: Nikiski Combined Cycle Plant Process Flow Diagram




| STREAM NUMBER | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREAM NAME | RAW WATER | FIRE/SERVICE WATER OUTLET | HRSG BLOWDOWN | STG BLDG. SERVICE WATER | CTG BLDG. SERVICE WATER | FIRE WATER | - | - | - | DIRTY WATER | R.O. WATER SUPPLY | CARBON FILTER BACKWASH | OZONE INJECTION | 1ST PASS R.O. INFLUENT | 1ST PASS R.O. EFFLUENT | 1ST PASS R.O. REJECT | 2ND PASS R.O. REJECT | R.O. PERMEATE | DEMIN. WATER TO STORAGE | DEMINERALIZED WATER SUPPLY | HRSG MAKEUP | STG BLDG. WATER LAB | STEAM SAMPLE PANEL | AUX. COOLING WATER MAKEUP | HRSG CHEMICAL FEED DILUTION | CTG NOx CONTROL | AREA DRAINS / WASH DOWN | CTG OR STG BLDG. WASTEWATER FLOW |
| AVE. FLOW (GPM) | 37.5 | 44.5 | 7.0 | 0 | 0 | 0 | - | - | - | 1.0 | 42.5 | 0 | - | 38 | 30.5 | 7.5 | 4.5 | 26 | 26 | 26 | 7.0 | 2.0 | 1.0 | 0 | 1.0 | 15 | 0 | 0 |
| MAX. FLOW (GPM) | 48 | 63 | 15 | 10 | 10 | 2500 | - | - | - | 2.0 | 45 | 188 | - | 51 | 41 | 9 | 6.0 | 36 | 36 | 36 | 15 | 2.0 | 1.0 | 2.0 | 1.0 | 17 | 10 | 10 |

## APPENDIX B. BASIS FOR EFFLUENT LIMITS

The Clean Water Act (CWA or Act) requires steam electric power generation facilities to meet effluent limits based on available wastewater treatment technology, specifically, technology-based effluent limits. The Department may find, by analyzing the effect of an effluent discharge on the receiving water body, that technology-based effluent limits are not sufficiently stringent to meet state water quality standards (WQS). In such cases, the Department is required to develop more stringent water quality-based effluent limits (WQBELs), which are designed to ensure that the WQS of the receiving water body are met.

Technology-based effluent limits for steam electric power generation facilities do not limit every parameter that may be present in the effluent. Technology-based effluent limits have only been developed for total suspended solids and oil and grease for new sources discharging low volume wastes, as well as pH and Polychlorinated Biphenyls (PCBs) for all new sources discharging wastewater. Depending on where the facility draws its water and how it handles its water for their purposes, their effluent might contain metals and other toxic pollutants. This is the case for the Nikiski facility which draws its source water from groundwater, which contains naturally occurring elevated concentrations of arsenic. When technology-based effluent limits do not exist for a particular pollutant expected to be in the effluent, the Department must determine if the pollutant may cause or contribute to an exceedance of a WQS for the water body. If a pollutant may cause or contribute to an exceedance of a WQS, a WQBEL for the pollutant must be established in the permit. Since this is a new facility, reasonable potential for pollutants of concern identified in the permittee's application and subsequent WQBEL calculations were derived from the small monitoring data set submitted by the permittee. Sources of this monitoring data include: raw source water sample results (arsenic and copper) and worse case design values based on engineering specifications of the new facility (temperature and chlorine). More information on reasonable potential and WQBEL calculations can be found in subsequent sections of Appendices B through D.

### B.1 Technology-Based Effluent Limitations

#### B.1.1 Mass-Based Limitations

The regulation at 18 AAC 83.540 requires that effluent limits be expressed in terms of mass, if possible. The mass based limits are expressed in pounds per day and are calculated as follows:

Mass-based limit (lb/day) = concentration limit (mg/L) × design flow (mgd) × 8.341[1]

#### B.1.2 Effluent Limitation Guidelines

EPA has promulgated technology-based effluent limit guidelines (ELGs) and standards for process wastewater discharges from the steam electric power generating point source category at 40 CFR Part 423.

The ELGs applicable to a new source are sources that have commenced construction after the ELGs were promulgated (initially in 1974 and then revised on November 19, 1982). The Nikiski Combined Cycle Plant (NCC) is a proposed combined cycle power station that will route exhaust heat from an existing natural gas combustion turbine generator (CTG) to produce steam in an existing heat recovery steam generator (HRSG), which will then propel a new steam-driven turbine generator (STG). Since construction of the facility commenced after 40 CFR Part 423 was

[1] 8.341 is a conversion factor with units (lb × L) / (mg × gallon × $10^6$)

promulgated, the ELGs based on new source performance standards (NSPS) in 40 CFR §423.15 apply.

The ELGs contained in 40 CFR §423.15 include effluent limits for the following waste streams: low volume wastes, chemical metal cleaning wastes, bottom ash transport water, fly ash transport water, once-through cooling water, cooling tower blow down, and coal pile runoff. Based on information supplied by the permittee through its application and by correspondence, the facility's discharge will consist entirely of low volume wastes (intermittent discharges of first pass reverse osmosis reject water, raw water treatment system filtration unit backwash, and service water washdown from the STG and CTG buildings). Therefore, the following ELGs apply to the facility at Outfall 001:

**Table B-1: Technology-Based Effluent Limits (40 CFR §423.15, New Source Performance Standards)**

| Parameter | Average of daily values for 30 consecutive days shall not exceed (mg/L) | Maximum for any 1 day (mg/L) | Source |
|---|---|---|---|
| pH | a | | 40 CFR §423.15(a) |
| PCBs | b | | 40 CFR §423.15(b) |
| Total Suspended Solids (TSS) | 30.0 | 100.0 | 40 CFR §423.15(c) |
| Oil and Grease | 15.0 | 20.0 | 40 CFR §423.15(c) |

Notes:

a. The pH of all discharges, except once through cooling water, shall be within the range of 6.0–9.0.

b. There shall be no discharge of PCBs such as those commonly used for transformer fluid

## B.2 Water Quality-Based Effluent Limitations

### B.2.1 Statutory and Regulatory Basis

18 AAC 70.010 prohibits conduct that causes or contributes to a violation of the WQS.
18 AAC 17.090 requires that permits include terms and conditions to ensure criteria are met, including operating, monitoring, and reporting requirements.

The regulations require the permitting authority to make this evaluation using procedures that account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant in the effluent, species sensitivity (for toxicity), and where appropriate, dilution in the receiving water body. The limits must be stringent enough to ensure that WQS are met and must be consistent with any available wasteload allocation (WLA).

### B.2.2 Reasonable Potential Analysis

When evaluating the effluent to determine if WQBELs based on chemical-specific numeric criteria are needed, the Department projects the receiving water body concentration for each pollutant of concern downstream of where the effluent enters the receiving water body. The chemical-specific concentration of the effluent and receiving water body and, if appropriate, the dilution available from the receiving water body, are factors used to project the receiving water body concentration. If the projected concentration of the receiving water body exceeds the numeric criterion for a limited parameter, then there is a reasonable potential that the discharge may cause or contribute to an excursion above the applicable WQS, and a WQBEL must be developed.

### B.2.3 Procedure for Deriving Water Quality-Based Effluent Limits

The *Technical Support Document for Water Quality-Based Toxics Control* (TSD) (EPA, 1991) and the WQS recommend the flow conditions for use in calculating WQBEL using steady-state modeling. The TSD and the WQS state the WQBELs intended to protect aquatic life uses should be based on critical receiving water conditions.

The first step in developing a WQBEL is to develop a WLA for the pollutant. A WLA is the concentration or loading of a pollutant that the permittee may discharge without causing or contributing to an exceedance of WQS or a total maximum daily load in the receiving water body. If a mixing zone is authorized in the permit, the WQBELs apply at all points outside the mixing zone.

In cases where a mixing zone is not authorized, either because the receiving water body already exceeds the criterion, the receiving water body flow is too low to provide dilution, or for some other reason one is not authorized, the criterion becomes the WLA. Establishing the criterion as the WLA ensures that the permittee will not cause or contribute to an exceedance of the criterion.

The WQS at 18 AAC 70.020(a) designates classes of marine water for beneficial uses of water supply; water recreation; and of growth and propagation of fish, shellfish, other aquatic life, and wildlife.

### B.2.4 Specific Water Quality-Based Effluent Limits

#### *B.2.4.1 pH*

The criteria for the growth and propagation of fish shellfish, other aquatic life, and wildlife are the most stringent marine standards for pH. These standards establish a pH range of at least 6.5 to a maximum of 8.5 s.u.

#### *B.2.4.2 Chlorine (Total Residual)*

The most stringent state water quality criteria for total residual chlorine to protect designated uses for marine discharges requires that concentrations may not exceed 13 µg/L for acute aquatic life and 7.5 µg/L for chronic aquatic life [18AAC 70.020(b)(11)(c)]. The Department has authorized chronic and acute mixing zones with dilution factors of 7000:1 and 4000:1, respectively for meeting chronic and acute chlorine criteria. The reasonable potential analysis in Appendix C takes into account these dilution factors. Based on the WQS of 13 µg/L for protection from acute effects on aquatic life and 7.5 µg/L for protection from chronic effects on aquatic life, and on a maximum projected effluent concentration of 8.7 mg/L, the reasonable potential analysis indicates that chlorine (total residual) has reasonable potential to violate WQS at the boundary of the authorized mixing zone. The calculation of the WQBEL for chlorine, detailed in Appendix D, produces a monthly average limit of 26 mg/L and a daily maximum limit of 52 mg/L at the end of the discharge pipe.

#### *B.2.4.3 Temperature*

The criteria for the growth and propagation of fish shellfish, other aquatic life, and wildlife are the most stringent standards for temperature. The established temperature standard for marine waters is “may not cause the weekly average temperature to increase more than 1°C. The maximum rate of change may not exceed 0.5°C per hour. Normal daily temperature cycles may not be altered in amplitude or frequency."

## B.2.5 Selection of Most Stringent Limitations

### *B.2.5.1 Chlorine (total residual)*

The permit proposes WQBELs for chlorine (total residual).

### *B.2.5.2 Oil and Grease*

The permit proposes technology-based effluent limits for oil and grease.

### *B.2.5.3 pH*

The permit proposes the more stringent WQBELs for pH, which shall apply at the end-of-pipe.

**Table B-2: Selection of pH Permit Limits**

| | Minimum Daily (SU) | Maximum Daily (SU) |
|---|---|---|
| Technology Based Limits | 6.0 | 9.0 |
| Water Quality-Based Limits | 6.5 | 8.5 |
| Selected Limits | 6.5 | 8.5 |

### *B.2.5.4 Polychlorinated Biphenyl Compounds*

The permit proposes technology-based effluent limits for polychlorinated biphenyl compounds, which is no discharge of PCBs.

### *B.2.5.5 Total Suspended Solids*

The permit proposes technology-based effluent limits for total suspended solids.

## APPENDIX C. REASONABLE POTENTIAL DETERMINATION

The following describes the process the Department used to determine if the discharge authorized in the permit has the reasonable potential to cause or contribute to a violation of Alaska Water Quality Standards (WQS). The Department used the process described in the *Technical Support Document for Water Quality-Based Toxics Control* (*TSD*) (EPA, 1991) and DEC's guidance, Reasonable Potential Procedure for Water Quality-Based Effluent Limits, APDES Permit (January 2009) to determine the reasonable potential for any pollutant to exceed a water quality criterion.

To determine if there is reasonable potential for the discharge to cause or contribute to an exceedance of water quality criteria for a given pollutant, the Department compares the maximum projected receiving water body concentration to the criteria for that pollutant. Reasonable potential to exceed exists if the projected receiving water body concentration exceeds the criteria, and a water quality-based effluent limit (WQBEL) must be included in the permit (18 AAC 83.435). This section discusses how the maximum projected receiving water body concentration is determined.

### C.1 Mass Balance

For a discharge to marine waters, the maximum projected receiving water body concentration is determined using a steady state model represented by the following mass balance equation:

$$C_d = C_e + C_u \qquad \text{(Equation C-1)}$$

where,

$C_d$ = Receiving water body concentration downstream of the effluent discharge

$C_e$ = Maximum projected effluent concentration

$C_u$ = 95th percentile measured receiving water body upstream concentration

There may be cases where a dilution factor (mixing zone) is authorized. Where a dilution factor (D) is used, the following equation provides the receiving water concentration at the boundary of the mixing zone:

$$C_d = \frac{(C_e - C_U) + C_U}{D} \qquad \text{(Equation C-2)}$$

### C.2 Maximum Projected Effluent Concentration

To calculate the maximum projected effluent concentration, the Department used the procedure described in section 3.3 of the *TSD*, "Determining the Need for Permit Limits with Effluent Monitoring Data." In this procedure, the 99th percentile of the effluent data is the maximum projected effluent concentration, which is used in the calculation of the maximum projected receiving water body concentration.

Since there are a limited number of data points available, the 99th percentile is calculated by multiplying the maximum reported effluent concentration by a "reasonable potential multiplier" (RPM). The RPM is the ratio of the 99th percentile concentration to the maximum reported effluent concentration and accounts for the statistical uncertainty in the effluent data. The RPM is calculated from the coefficient of variation (CV) of the data and the number of data points. The CV is defined as the ratio of the standard deviation of the data set to the mean. When fewer than 10 data points are available, the *TSD* recommends making the assumption that the CV is equal to 0.6. A CV value of 0.6 is a conservative estimate that assumes a relatively high variability.

Using the equations in Section 3.3.2 of the *TSD*, the RPM for chlorine (total residual) is calculated as follows.

The percentile represented by the highest reported concentration is calculated.

$$p_n = (1 - confidence\ level)^{1/n} \qquad \text{(Equation C-7)}$$

Where,

$p_n$ = the percentile represented by the highest reported concentration
n = the number of samples
confidence level = 99% = 0.99

The data set contains one estimated chlorine concentration, therefore:

$$p_2 = (1 - 0.99)^{1/1}$$

$$p_2 = 0.01$$

This means that we can say, with 99.9% confidence that the maximum reported effluent chlorine concentration is greater than the 10th percentile.

The RPM is the ratio of the 99th percentile concentration (at the 99% confidence level) to the maximum reported effluent concentration. This is calculated as follows:

$$RPM = \frac{C_{99}}{C_p} \qquad \text{(Equation C-8)}$$

Where,

$$C = e^{(z\sigma - 0.5\sigma^2)} \qquad \text{(Equation C-9)}$$

Where,

$$\sigma^2 = \ln(CV^2 + 1) \qquad \text{(Equation C-10)}$$

$$\sigma = \sqrt{\sigma^2}$$

$$CV = \text{coefficient of variation} = \frac{standard\ deviation}{mean}$$

z = the inverse of the normal cumulative distribution function at a given percentile

In the case of chlorine:

CV = coefficient of variation = 0.6

$\sigma^2 = \ln(CV^2 + 1) = 0.3075$

$\sigma = \sqrt{\sigma^2} = 0.5545$

$z_{99}$ = 2.326 for the 99th percentile

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$z_{10}$ = -1.282 for the 10th percentile (from z-table)

$C_{99} = \exp(2.326 \times 0.5545 - 0.5 \times 0.3075) = 3.114$

$C_{10} = \exp(-1.282 \times 0.5545 - 0.5 \times 0.3075) = 0.4212$

$RPM = C_{99}/C_{10} = 3.114/0.4212$

**RPM = 7.393**

The maximum projected effluent concentration is determined by multiplying the maximum reported effluent concentration by the RPM:

$$C_e = (RPM) \times (MRC) \qquad \text{(Equation C-11)}$$

Where,

MRC = Maximum Reported Concentration

In the case of chlorine,

$C_e$ = (7.393)(8700 µg/L) = 64,319.1 µg/L or 64 mg/L (maximum projected effluent concentration)

**Comparison with ambient criteria for chlorine**

In order to determine if reasonable potential exists for this discharge to violate the ambient criteria, the highest projected concentrations are compared with the ambient criteria.

| | | |
|---|---|---|
| Acute | 64,000 µg/L > 7.5 µg/L (acute criteria) | **YES**, there is a reasonable potential to violate |
| Chronic: | 64,000 µg/L > 13 µg/L (chronic criteria) | **YES**, there is a reasonable potential to violate |

Since there is a reasonable potential for the effluent to cause an exceedance of acute and chronic WQS for protection of aquatic life, a WQBEL for chlorine is required. See Appendix D for that calculation.

## APPENDIX D. EFFLUENT LIMIT CALCULATION

Once the Department determines that the effluent has a reasonable potential to exceed a water quality standard (WQS), a water quality-based effluent limit (WQBEL) for the pollutant is developed. The first step in calculating a permit limit is development of a waste load allocation (WLA) for the pollutant.

### D.1 WLAs

When dilution is available, the WLA is calculated using the available dilution, background concentrations of the pollutant, and the WQS.

Acute and chronic aquatic life standards apply over different time frames and therefore it is not possible to compare the WLAs directly to determine which standard results in the most stringent limits. To allow for comparison, long-term average (LTA) loads are calculated from both the acute and chronic WLAs. The most stringent LTA is used to calculate the permit limits.

### D.2 Permit Limit Derivation

Once the appropriate LTA has been calculated, the Department applies the statistical approach described in Chapter 5 of the *Technical Support Document for Water Quality-Based Toxics Control* (*TSD)* to calculate maximum daily and average monthly permit limits. This approach takes into account effluent variability [using the Coefficient Variation (CV)], sampling frequency, and the difference in time frames between the average monthly and maximum daily limits.

The maximum daily limit is based on the CV of the data and the probability basis, while the average monthly limit is dependent on these two variables and the monitoring frequency. As recommended in the *TSD*, the Department used a probability basis of 95 percent for average monthly limit calculation and 99 percent for the maximum daily limit calculation.

The following is a summary of the steps to derive water quality-based effluent limitations from water quality criteria for pollutants that have a reasonable potential to exceed WQS. Arsenic is used as an example.

**<u>Step 1- Determine the WLA</u>**

The acute and chronic aquatic life criteria are converted to acute and chronic WLAs ($WLA_{acute}$ or $WLA_{chronic}$) using the following equation:

1. $$Q_d C_d = Q_e C_e + Q_u C_u$$

$Q_d$ = downstream flow = $Q_u + Q_e$
$C_d$ = aquatic life criteria that cannot be exceeded downstream
$Q_e$ = effluent flow
$C_e$ = concentration of pollutant in effluent = $WLA_{acute}$ or $WLA_{chronic}$
$Q_u$ = upstream flow
$C_u$ = upstream background concentration of pollutant

Rearranging the above equation to determine the effluent concentration ($C_e$) or WLA results in the following:

2. $$C_e = WLA = \frac{Q_d C_d - Q_u C_u}{Q_e} = \frac{C_d(Q_u + Q_e) - Q_u C_u}{Q_e}$$

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when $C_u$ is zero, this equation becomes:

3. $$C_e = WLA = \frac{Q_d C_d}{Q_e}$$

With 7000:1 chronic and 4000:1 acute dilution ratios, the equation becomes

4. $WLA_{chronic} = 7000 * C_d$

$WLA_{acute} = 4000 * C_d$

For example, the calculation for the chlorine chronic WLA is:

$C_e = WLA_{chronic} = 7000 * 7.5 = 52500$ µg/L

the calculation for the chlorine acute WLA is:

$C_e = WLA_{acute} = 4000 * 13 = 52000$ µg/L

**<u>Step 2 - Determine the Long-Term Average (LTA)</u>**

$LTA_{acute}$ and $LTA_{chronic}$ concentrations are calculated from the acute and chronic WLAs using the following equations:

$$LTA_{acute} = WLA_{acute} * e^{(0.5\sigma^2 - z\sigma)}$$

where,

$$\sigma^2 = \ln(CV^2 + 1)$$

z = 2.326 for 99th percentile probability basis

$$CV = coefficient\ of\ variation = 0.6$$

$$LTA_{chronic} = WLA_{chronic} * e^{(0.5\sigma^2 - z\sigma)}$$

where,

$$\sigma^2 = \ln\left(\frac{CV^2}{4} + 1\right)$$

z = 2.326 for $99^{th}$ percentile probability basis

$$CV = coefficient\ of\ variation = 0.6$$

**<u>Step 3 - Most Limiting LTA</u>**

To protect a water body from both acute and chronic effects, the more limiting of the calculated $LTA_{acute}$ and $LTA_{chronic}$ is used to derive the effluent limits. The *TSD* recommends using the $95^{th}$ percentile for the Average Monthly Limit (AML) and the $99^{th}$ percentile for the Maximum Daily Limit (MDL).

**<u>Step 4 - Calculate the Permit Limits</u>**

The maximum daily limit (MDL) and the average monthly limit (AML) are calculated as follows:

$$MDL = LTA_{chronic} * e^{(z\sigma - 0.5\sigma^2)}$$

where,

$$\sigma^2 = \ln(CV^2 + 1)$$

z = 2.326 for $99^{th}$ percentile probability basis

CV = coefficient of variation

$$AML = LTA_{chronic} * e^{(z\sigma - 0.5\sigma^2)}$$

where,

$$\sigma^2 = \ln\left(\frac{CV^2}{n} + 1\right)$$

z = 1.645 for $95^{th}$ percentile probability basis

$$CV = coefficitent\ of\ variation = \frac{standard\ deviation}{mean}$$

n = number of sampling events required per month for chlorine = 4 (based on sampling on a weekly basis)

The calculations for chlorine limits are provided below as an example:

**<u>Step 1- Determine the WLA</u>**

WLA = $C_d$

Chronic $C_e$ = $WLA_{chronic}$ = 52500 µg/L

Acute $C_e$ = $WLA_{acute}$ = 52000 µg/L

**<u>Step 2 - Determine the Long-Term Average (LTA)</u>**

$$LTA_{acute} = WLA_{acute} * e^{(0.5\sigma^2 - z\sigma)}$$

where,

$$\sigma^2 = \ln(CV^2 + 1)$$

$$\sigma^2 = \ln(0.6^2 + 1)$$

$$\sigma^2 = 0.3075$$

$$z = 2.326\ for\ 99^{th}\ percentile\ probability\ basis$$

$$LTA_{acute} = 16697$$

$$LTA_{chronic} = WLA_{chronic} * e^{(0.5\sigma^2 - z\sigma)}$$

where,

$$\sigma^2 = \ln\left(\frac{CV^2}{4} + 1\right)$$

$$\sigma^2 = \ln\left(\frac{0.6^2}{4} + 1\right)$$

$$\sigma^2 = 0.08618$$

$$z = 2.326\ for\ 99^{th}\ percentile\ probability\ basis$$

$$LTA_{chronic} = 27691$$

**Step 3 - Most Limiting LTA**

$LTA_{acute}$ is the most limiting LTA.

**Step 4 - Calculate the Permit Limits**

The MDL and the AML are calculated as follows:

$$MDL = LTA_{acute} * e^{(z\sigma - 0.5\sigma^2)}$$

where,

$$\sigma^2 = \ln(CV^2 + 1)$$

$$\sigma^2 = \ln(0.6^2 + 1)$$

$$\sigma^2 = 0.3075$$

$$z = 2.326\ for\ 99^{th}\ percentile\ probability\ basis$$

CV = coefficient of variation = 0.6

**MDL = 52 mg/L**

$$AML = LTA_{chronic} * e^{(z\sigma - 0.5\sigma^2)}$$

where,

$$\sigma^2 = \ln\left(\frac{CV^2}{n} + 1\right)$$

$$\sigma^2 = \ln\left(\frac{0.6^2}{4} + 1\right)$$

$$\sigma^2 = 0.08618$$

$z = 1.645$ for $95^{\text{th}}$ percentile probability basis

$CV$ = coefficient of variation = 0.6

n = number of sampling events required per month for chlorine = 4 (based on sampling on a weekly basis)

**AML = 26 mg/L**

## APPENDIX E. MIXING ZONE ANALYSIS CHECKLIST

**Mixing Zone Authorization Checklist**

**based on Alaska Water Quality Standards (2003)**

The purpose of the Mixing Zone Checklist is to guide the permit writer through the mixing zone regulatory requirements to determine if all the mixing zone criteria at 18 AAC 70.240 through 18 AAC 70.270 are satisfied, as well as provide justification to authorize a mixing zone in an APDES permit. In order to authorize a mixing zone, all criteria must be met. The permit writer must document all conclusions in the permit Fact Sheet; however, if the permit writer determines that one criterion cannot be met, then a mixing zone is prohibited, and the permit writer need not include in the Fact Sheet the conclusions for when other criteria were met.

| Criteria | Description | Resources | Regulation |
|---|---|---|---|
| Size | Is the mixing zone as small as practicable?<br>Yes, see section 4.3.1 of the fact sheet<br>- Permit writer conducts analysis and documents analysis in Fact Sheet at:<br>►Section 4.2 Mixing Zone Analysis-. | •Technical Support Document for Water Quality Based Toxics Control<br>•Fact Sheet, Section 4.3<br>• Fact Sheet, Section 4.3.1<br>• DEC's RPA Guidance<br>• EPA Permit Writers' Manual | 18 AAC 70.240 (a)(2)<br>18 AAC 70.245 (b)(1) - (b)(7)<br>18 AAC 70.255(e) (3)<br>18 AAC 70.255 (d) |
| Technology | Were the most effective technological and economical methods used to disperse, treat, remove, and reduce pollutants?<br>Yes<br>**If yes**, describe methods used in Fact Sheet at Section 4.3 Mixing Zone Analysis. | • Fact Sheet, Section 4.3.2 | 18 AAC 70.240 (a)(3) |

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| Criteria | Description | Resources | Regulation |
|---|---|---|---|
| Existing use | Does the mixing zone… | | |
| | (1) partially or completely eliminate an existing use of the water body outside the mixing zone?<br>No<br>**If yes, mixing zone prohibited.** | • Fact Sheet Section 4.3.3 | 18 AAC 70.245(a)(1) |
| | (2) impair overall biological integrity of the water body?<br>No<br>**If yes, mixing zone prohibited.** | • Fact Sheet Section 4.3.3 | 18 AAC 70.245(a)(2) |
| | (3) provide for adequate flushing of the water body to ensure full protection of uses of the water body outside the proposed mixing zone?<br>Yes<br>**If no, then mixing zone prohibited.** | • Fact Sheet Section 4.3.3 | 18 AAC 70.250(a)(3) |
| | (4) cause an environmental effect or damage to the ecosystem that the department considers to be so adverse that a mixing zone is not appropriate?<br>No<br>**If yes, then mixing zone prohibited.** | • Fact Sheet Section 4.3.3 | 18 AAC 70.250(a)(4) |
| Human | Does the mixing zone… | | |

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| Criteria | Description | Resources | Regulation |
|---|---|---|---|
| consumption | (1) produce objectionable color, taste, or odor in aquatic resources harvested for human consumption?<br>No<br>**If yes, mixing zone may be reduced in size or prohibited.** | • Fact Sheet Section 4.3.4 | 18 AAC 70.250(b)(2) |
| | (2) preclude or limit established processing activities of commercial, sport, personal use, or subsistence shellfish harvesting?<br>No<br>**If yes, mixing zone may be reduced in size or prohibited.** | • Fact Sheet Section 4.3.4 | 18 AAC 70.250(b)(3) |
| Spawning Areas | Does the mixing zone… | | |
| | (1) discharge in a spawning area for anadromous fish or Arctic grayling, northern pike, rainbow trout, lake trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, king, and sockeye salmon?<br>No<br>**If yes, mixing zone prohibited.** | • Fact Sheet Section 4.3.5 | 18 AAC 70.255 (h) |
| Human Health | Does the mixing zone… | | |

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| Criteria | Description | Resources | Regulation |
|---|---|---|---|
| | (1) contain bioaccumulating, bioconcentrating, or persistent chemical above natural or significantly adverse levels?<br>No<br>**If yes, mixing zone prohibited.** | • Fact Sheet Section 4.3.4 | 18 AAC 70.250 (a)(1) |
| | (2) contain chemicals expected to cause carcinogenic, mutagenic, tetragenic, or otherwise harmful effects to human health?<br>No<br>**If yes, mixing zone prohibited.** | • Fact Sheet Section 4.3.4 | |
| | (3) Create a public health hazard through encroachment on water supply or through contact recreation?<br>No<br>**If yes, mixing zone prohibited.** | • Fact Sheet Section 4.3.4 | 18 AAC 70.250(a)(1)(C) |
| | (4) meet human health and aquatic life quality criteria at the boundary of the mixing zone?<br>Yes<br>**If no, mixing zone prohibited.** | • Fact Sheet Section 4.3.1 | 18 AAC 70.255 (b),(c) |
| | (5) occur in a location where the department determines that a public health hazard reasonably could be expected?<br>No | • Fact Sheet Section 4.3.4 | 18 AAC 70.255(e)(3)(B) |

| Criteria | Description | Resources | Regulation |
|---|---|---|---|
| | **If yes, mixing zone prohibited.** | | |
| Aquatic Life | Does the mixing zone… | | |
| | (1) create a significant adverse effect to anadromous, resident, or shellfish spawning or rearing?<br>No<br>**If yes, mixing zone prohibited.** | • Fact Sheet Section 4.3.6 | 18 AAC 70.250(a)(2)(A-C) |
| | (2) form a barrier to migratory species?<br>No<br>**If yes, mixing zone prohibited.** | • Fact Sheet Section 4.3.6 | |
| | (3) fail to provide a zone of passage?<br>No<br>**If yes, mixing zone prohibited.** | • Fact Sheet Section 4.3.6 | |
| | (4) result in undesirable or nuisance aquatic life?<br>No<br>**If yes, mixing zone prohibited.** | • Fact Sheet Section 4.3.6 | 18 AAC 70.250(b)(1) |
| | (5) result in permanent or irreparable displacement of indigenous organisms?<br>No<br>**If yes, mixing zone prohibited.** | • Fact Sheet Section 4.3.1 | 18 AAC 70.255(g)(1) |

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| Criteria | Description | Resources | Regulation |
|---|---|---|---|
| | (6) result in a reduction in fish or shellfish population levels?<br>No<br>**If yes, mixing zone prohibited.** | • Fact Sheet Section 4.3.6 | 18 AAC 70.255(g)(2) |
| | (7) prevent lethality to passing organisms by reducing the size of the acute zone?<br>No<br>**If yes, mixing zone prohibited.** | • Fact Sheet Section 4.3<br>• Fact Sheet Section 4.3.1 | 18 AAC 70.255(b)(1) |
| | (8) cause a toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone?<br>No<br>**If yes, mixing zone prohibited.** | • Fact Sheet Section 4.3.4 | 18 AAC 70.255(b)(2) |

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